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EXAMINER

AMARI, ALESSANDRO V

ART UNIT PAPER NUMBER

2872

DATE MAILED: 06/13/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/905,769

Applicant(s)

FRICK ET AL.

Examiner

Alessandro V. Amari

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-46 is/are pending in the application.
- 4a) Of the above claim(s) 16, 17 and 36-46 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6, 9-12, 14, 15, 18-24, 26, 29, 34, 35 is/are rejected.
- 7) ☒ Claim(s) 7, 8, 13, 25, 27, 28 and 30-33 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6, 8, 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION***Election/Restrictions***

1. Claims 16, 17, 36-42 and 43-46 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 10. It should be noted that the Applicant claims 1-15 and 17-35 as readable upon species 2 of Invention I. However, species 2 of Invention I cannot include claim 17, which is part of the Group II invention. Therefore, claim 17 cannot be deemed part of the election and has been withdrawn.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2-6, 9, 12, 14, 15, 19, 20, 23, 24, 26, 29 and 35 are rejected under 35 U.S.C. 102(b) as being anticipated by Sunagawa U.S. Patent 5,315,676.

In regard to claims 1 and 29, Sunagawa discloses (see Figures 1A, 2 and 3) an integrated optical device comprising an optical substrate (11) wherein an incident light signal is propagating within the substrate in a primary direction of propagation reflecting off a top surface of the substrate under total internal reflection as shown in Figures 1A and 3; and a diffractive optical element (21, 20) having a plurality of spaced-apart members formed of an optically transparent material and disposed above the top

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surface of the substrate with the members being spaced apart a spacing distance and having member widths, whereby the sum, a , of the spacing distance and the member width is chosen such that a light signal traveling within the substrate under total internal reflection off the top surface in an incident direction of propagation and incident upon the diffraction grating is reflected into a first diffracted order propagating within the substrate in a reflected direction of propagation defining an angle, θ_p , with respect to the incident direction of propagation and propagating within the substrate under total internal reflection such that the incident light signal is reflected within the substrate along a desired direction of propagation as shown in Figures 1A, 2 and 3.

Regarding claim 2, Sunagawa discloses that the substrate is formed of quartz as described in column 9, lines 26-28.

Regarding claim 3, Sunagawa discloses that the substrate is formed of sapphire as described in column 9, lines 26-28.

Regarding claim 4, Sunagawa discloses that the members are a plurality of strips that are substantially parallel as shown in Figures 1A and 3.

Regarding claim 5, Sunagawa discloses that the plurality of strips each have a substantially identical strip width as described in column 9, lines 51-66.

Regarding claim 6, Sunagawa discloses that the plurality of strips are each spaced apart a substantially equal spacing distance as described in column 9, lines 51-66.

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Regarding claim 9, Sunagawa discloses that the thickness of the members is adjusted to maximize the intensity of the reflected light signal as described in column 9, lines 51-61 and as shown in Figure 1D.

Regarding claim 12, Sunagawa discloses that the members are disposed in direct contact with the top surface of the substrate as shown in Figures 1A and 3.

Regarding claim 14, Sunagawa discloses that the diffractive optical element produces a first order diffracted mode that travels within the substrate in the desired direction of propagation at an angle to the primary direction of propagation as described in column 10, lines 25-40.

Regarding claim 15, Sunagawa discloses that the first order diffracted mode travels within the substrate under total internal reflection as described in column 10, lines 25-40.

Regarding claim 19, Sunagawa discloses that the members are substantially parallel linear elements as shown in Figures 1A and 2.

Regarding claim 20, Sunagawa discloses that the members are formed on the top surface of the substrate by depositing a silicon material in a patterned form. It should be noted that this claim is a product-by-process claim, which is the same as a product from the prior art, and is therefore unpatentable even though the prior product was made by a different process. [*In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966] See MPEP 2113.

Regarding claims 23 and 35, Sunagawa discloses that the members have a higher index of refraction than that of the substrate as shown in Figures 1A, 2 and 3.

Although the prior art does not specifically disclose that the members have a higher index of refraction than that of the substrate, this feature is seen to be an inherent teaching of the device since it is apparent that the refractive indices of the substrate and members must be different in order for the device to function as intended.

Regarding claim 24, Sunagawa discloses that the diffractive optical element operates by means of total internal reflection as shown in Figures 1A and 2.

Regarding claim 26, Sunagawa discloses that the members each have a width selected to maximize the intensity of the reflected light signal in column 9, lines 51-68 and column 10, lines 1-46 and as shown in Figure 1D.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sunagawa U.S. Patent 5,315,676.

Regarding claim 18, Sunagawa teaches the invention as set forth above but does not disclose the light beam is coupled into the substrate through a GRIN lens.

Official Notice is taken that it is notoriously old and well known to utilize GRIN lens in the optical device art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize a GRIN lens in the optical device of Sunagawa in order to collimate the light into the device.

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6. Claims 10, 11, 21, 22 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sunagawa U.S. Patent 5,315,676.

Regarding claims 10, 11, 21, 22, and 34, teaches the invention as set for above but does not teach that the members are formed of a material selected from the grouping consisting of amorphous silicon, crystalline silicon, and poly-silicon or that the members are formed of a material selected from the grouping consisting of alumina, sapphire, silicon nitride, and an alloy of poly-silicon and poly-germanium or that the members and substrate are formed of the same material or that the material is sapphire. It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the materials cited above, since it has been held to be within the ordinary skill of a worker in the art to select a known material on the basis of its suitability for the intended use. One would have been motivated to utilize the materials cited above for the purpose of forming an optical waveguide which guides the optical wave very efficiently through the waveguide.

Allowable Subject Matter

7. Claims 7, 8, 13, 25, 27, 28, 30, 31, 32, and 33 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. Claims 7 and 33 are allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "the plurality of strips each have a substantially identical strip width, the plurality of strips are each spaced apart a

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substantially equal spacing distance, and the spacing distance is substantially identical to the strip width” as set forth in the claimed combination. Claim 8 is also allowable based on its dependence on claim 7.

Claim 13 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, “the members are disposed in evanescent field coupling contact with the top surface of the substrate” as set forth in the claimed combination.

Claim 25 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, “a plurality of incident light signals each having a different wavelength and wherein the diffractive optical element reflects each channel into a different first order diffracted mode such that each reflected light signal travels within the substrate in one of plurality of secondary directions of propagation each at an angle to the primary direction of propagation” as set forth in the claimed combination.

Claim 27 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, “the members are formed of a plurality of strips, each strip having a width, and an associated spacing, wherein the widths and the spacings vary among the strips” as set forth in the claimed combination. Claim 28 is also allowable based upon its dependence on claim 27.

Claim 30 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, “wherein the sum, a , is between $.5\lambda$ and 4λ , where λ is the wavelength of the light signal within the substrate” as set forth in the claimed combination. Claim 31 is also allowable based upon its dependence on claim 30.

Claim 32 is allowable over the prior art for at least the reason that the prior art fails to teach or reasonably suggest, "wherein the light signal is incident upon the diffraction grating at an angle, θ , above a critical angle, θ being measured from a normal to the top surface of the substrate extending into the substrate, and wherein the sum a is chosen such that θ_p is greater than 90° and less than 180° " as set forth in the claimed combination.

The prior art of record, Sunagawa teaches an integrated optical device which comprises a substrate wherein an incident light signal is propagating within the substrate in a primary direction of propagation reflecting off atop surface of the substrate under total internal reflection; and a diffractive optical element having a plurality of spaced-apart members formed of an optically transparent material and disposed above the top surface of the substrate such that the incident light signal is reflected within the substrate along a desired direction of propagation and wherein the members are a plurality of strips and wherein the strips are adjusted to maximize the intensity of the reflected light. However, Sunagawa does not teach the specific physical characteristic of the strips and relationships of distances and widths as claimed and there is no motivation or teaching to modify this difference as derived.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alessandro V. Amari whose telephone number is (703) 306-0533. The examiner can normally be reached on Monday-Friday 8:00 AM to 5:30 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on (703) 308-1687. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ava *ava*
June 11, 2003

Mark A. Robinson
MARK A. ROBINSON
PRIMARY EXAMINER